AD-A137 396 REDESIGN OF CARGO MOBILITY CONTAINERS(U) AIR FORCE 1/1
PACKAGING EVALUATION AGENCY WRIGHT-PATTERSON AFB OH
20 OCT 83

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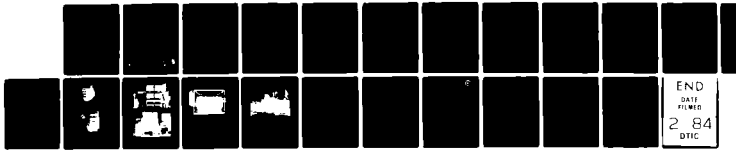

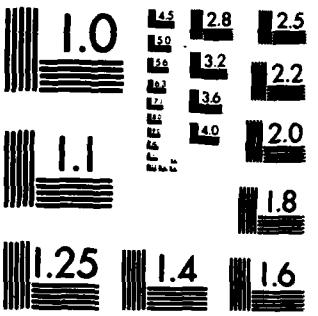

USAF PRAM PROGRAM

Final Report

Air Force Packaging Evaluation Agency

Pram Project

Redesign of Cargo Mobility Containers

Approved for Public Release
Distribution Unlimited

Approved by:

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ACRONYMS

BLSS	Base Level Self-sufficiency Spares
CDR	Critical Design Review
CFOSS	Combat Follow-on Supply Support
CRAF	Commercial Reserve Air Fleet
EOQ	Economic Order Quantity
FMS	Foreign Military Sales
PAD	Program Action Directive
PDR	Preliminary Design Review
PMRT	Program Management Responsiblity
POM	Program Objective Memorandum
PRAM	Productivity, Reliability, Availability, and Maintainability
RDF	Rapid Deployment Force
RFP	Request for Proposal
RSAF	Royal Saudi Arabia Air Force
SOW	Statement of Work
WRSK	War Readiness Spares Kit
DT&E	Development Test and Evaluation
IOT&E	Initial Operation Test and Evaluation

Introduction

Management and acquisition for a family of newly configured mobility containers was assigned to the Air Force Packaging Evaluation Agency (AFPEA). Program support, along with development funding for prototyping and testing, was provided by ASD/AFALD Productivity, Reliability, Availability and Maintainability (PRAM) office. The program objective, established by HQ USAF, was to implement an aggressive US Air Force Mobility Container Enhancement Program. As a result, new mobility containers were designed to maximize the cube usage of 463L pallets on C-141, C-130, KC-135, CRAF, and C-5 aircraft for MAC, TAC, SAC, NGB, and AFRES cargo mobility operations for their War Readiness Spares Kits (WRSK), Base Level Spares Support (BLSS), and Combat Follow-on Supply Support (CFOSS).

Executive Summary

Mobility containers are used by MAJCOMs and AFRES in mobility operations for movement of their WRSK, BLSS, and CFOSS items. Original mobility bins were designed during World War II for the B-29 aircraft. It is a relatively small container constructed of thin aluminum sheet metal reinforced with aluminum ribs (atch #1). These bins when loaded on 463L cargo pallets, achieve only about 50 percent use of aircraft cargo/pallet capacity.

HQ USAF directed AFLC, who in turn assigned responsibility to the Air Force Packaging Evaluation Agency to develop and implement an aggressive US Air Force Mobility Container Enhancement Program, which would provide a new configuration of containers to the users within the earliest practical time frame. The program objective was to improve the mobility and readiness of Air Force units during rapid deployment of forces.

A set of new fiberglass modular air cargo containers and metal tire racks were designed and tested during this project. The set of six containers are available in four sizes and are equipped with removable wheels, forklift openings, tie-down/hoisting rings, a single release door system, and adjustable removable shelves (atch #2).

The tire racks are of frame-structure, 84 inches in length and can vary in height and width to accommodate wheel and tire assemblies ranging from 17 to 58 inches in diameter. Each is equipped with forklift openings, tie-down/hoisting rings, an adjustable lateral restraint system and a chain across the front to retain tires in the rack (atch #3).

A seven-year implementation plan for USAF MAJCOMs is programmed to cost $23 million. Additional requirements for Army, Navy, Royal Saudi Arabia AF, Canada, and possibly the United Kingdom are being identified. A competitive firm fixed-priced development and test contract for $382,000 with production options was awarded to Transequip, Inc., Compton CA. Successful operational test and evaluation was completed during April 82. Delivery of first-year production of 3,600 mobility containers and 1,020 tire racks at a cost of $7 million was completed during FY83.

The PRAM investment in this project was $400,000 for development and test. Net savings are estimated at $238 million in aircraft operational costs over a seven-year period.

LESSONS LEARNED

Redesign of Cargo Mobility Containers

1. Design characteristics of container(s) for movement of air cargo should include:

a. Full utilization of space on the 463L pallet system and not exceed the total pallet load limit of 10,000 pounds or the 250 psi point load limit.

b. Height of each container or stack of containers should not exceed 90 inches for military aircraft and 60 inches for civilian aircraft.

c. Container design configuration should allow full utilization of available cargo space on military and civilian aircraft.

d. Strength to weight ratio of materials used in container construction is important to provide best aircraft utilization.

2. Container technical order needs to be developed along with container design to provide a means to maintain, modify, repair, or replace parts as needed over many years of service.

Technical Investigation

Statement of the Problem

The original mobility container was designed during World War II for use on the B-29 aircraft. It does not satisfy current mobility requirements, therefore, Program Action Directive (PAD) 80-LOW-043(1), 17 Mar 1980, which transmitted and supplemented HQ USAF/LEY message 051745Z, February 1980, was issued. The PAD directed development and implementation of an aggressive Mobility Container Enhancement Program.

Technical Approach

Within AFLC, AFALD/PT was assigned the development and acquisition management for this program to provide newly configured containers to user commands within the earliest practical time frame. WR-ALC/MM/DSP was assigned responsibility to be responsive to the program requirements for logistics support. The major user commands, HQ AAC/LGXR, HQ AFCC/LGS, HQ AFRES/LGSW, HQ MAC/LGSWR, HQ PACAF/LGS, HQ SAC/LGL, HQ TAC/LGSEA, HQ USAFE/LGSSO and NGB, actively participated in the program development and defining their operational requirements.

Meetings were held with user activities to determine the extent of the problem and develop requirements based on visits to actual storage areas. Available cargo space on C-141, C-130, C-5, KC-135, and CRAF aircraft along with door sizes and loading procedures were determined.

Findings

The KC-135 has no roller system to accommodate the 463L pallets. Therefore, a separate requirement was identified by SAC for a special wheel system for the currently used aluminum containers, as well as the newly designed fiberglass containers. A further limitation was identified which established a maximum point loading on the aircraft floor at 25 psi. This aspect of the project was not implemented due to marginal results of first article testing. The distribution of weight was acheived so that the 25 psi point loading was not exceeded. However, the wheel system was expensive and the container stability was in question when pushing or towing the currently used narrow aluminum container.

A comparison was made of available cargo space and aircraft loading limitations to the original mobility containers when loaded on a 463L cargo pallet (atch #4). It was determined that only 50-70 percent of the aircraft cargo/pallet capacity was used. It was also found that only three of the mobility containers can currently be loaded on a 463L pallet, representing a potential loss of approximately 50 percent of the present cargo/pallet capacity. Because of the dimensions of the present mobility container and its incompatibility with the 463L pallet, the user commands have indicated the following deficiencies:

a. Cargo must be piled on top of the containers to maximize cube usage in C-141, C-130 and C-5 aircraft.

b. Insufficient prepositioning of tie-down rings which requires extensive strapping to secure the load.

c. Built-up tires and wheels will not fit inside the containers.

d. Small Economic Order Quantity (EOQ) assets or bulky items cannot be effectively stored. Consequently, a complete redesign of mobility containers was initiated, taking into account all user requirements. This resulted in a fully coordinated Statement of Work (SOW) and performance specification for contractual action.

Recommendations

Successful definition of requirements by using commands made possible the development, design, test, and implementation of newly configured mobility containers. The increased effectiveness has been recognized by other activities (Army, Navy, and foreign countries) who have initiated actions for procuring quantities. Attachment 5 is a list of pertinent information such as NSN, part no., size, cube, tare weight and other information regarding the new containers and tire racks. It is recommended that:

1. Any configuration changes for out-year procurement should be fully documented and coordinated with user commands.

2. Interior configuration of containers for added shelving, trays, compartments, drawers, etc., should be determined by each user since the requirement may be different depending upon specific items to be stored/transported.

3. Procurement should be competitive with an option to acquire added quantities to satisfy increasing demands.

4. Limited first article testing should always be conducted whenever a change in manufacturer is made.

5. For all new manufacturers, quality control procedures should be reviewed by user activities.

Implementation

Plan

The master program schedule is shown on atch #6. Manufacturing of the first procurement of 3600 mobility containers and 1020 tire racks at a cost of $7 million was started in May 1982 and is scheduled for completion in Oct 83. The forecast for delivery of additional mobility containers are as follows:

	Fiscal Year					
NSN	84	85	86	87	88	89
8145-01-118-9872	413	343	292	292	292	292
8145-01-118-9873	413	343	292	292	292	292
8145-01-118-9874	826	686	584	584	584	584
8145-01-118-9884	826	686	584	584	584	584

Funding for these requirements has been identified in the USAF Program Objective Memorandum (POM) for FY84 - FY89 at 23 million dollars.

The System Manager for all future procurements regarding the mobility containers is WR-ALC/MMT. Program Management Responsibility Transfer (PMRT) was accomplished on 19 May 1983.

Situation/Status

A substantial contribution to combat capability is realized by providing full usage of cargo space during rapid deployment of forces. A conservative estimate of 30 percent increase in cube usage of cargo-related flights can be achieved under MAC, TAC, NGB, and AFRES cargo mobility operations. The program savings which can be anticipated as a result of this effort over a seven-year period is $238 million.

Recommended Audit Method

The savings, both tangible and intangible, should be based upon findings during IOT&E conducted under MAC project 15-45-81, during 19-20 Apr 1982 (atch #7). Continuous auditing follow-up can be accomplished in the same manner by MAJCOMs.

Economic Summary

Estimated savings are based upon projected reduction in aircraft flying hours for the C-5, C-130, and C-141 over a seven-year period. About 10-20 percent of the C-5, C-130, and C-141 flying hours and yearly costs are contributed to the cargo mobility usage. A conservative estimate based upon project (MAC 15-45-81) findings, indicates a 30 percent increase in cube usage with the newly configured mobility containers. An increase of 30 percent cube usage of 10 percent cargo related flying hours, i.e., 3 percent of the yearly operating cost, and deducting the added cost (30 percent) for carrying extra cargo, results in a yearly savings of about $33,284,199. Therefore, the minimum reduction in operating costs for the seven-year period should be about $237,558,866 for the C-5, C-130, and C-141 aircraft.

Costs:

PRAM Project Development Costs		$400,000
Contractual	$381,710.24	
In-house	$ 18,289.76	
Implementation Costs		$28,714,726
TOTAL COSTS (USAF)		$29,114,726

Savings:

Projected gross savings (7 years)	$266,273,592
Net Savings	$237,558,866

Implementation Schedule/Cost

FY82:

USAF

Development Cost		$391,530
Container Sets	512	$4,420,608
Tire Racks	1004 each	$902,588
		$5,714,726

RSAF

Container - Sets	88	$777,546
Tire Racks -	16 each	$13,312
Internal Assets - (shelves, trays, etc.)-		$577,523
		$1,368,381
TOTAL (FY82)		$7,083,107

FY83-FY89:

PROJECTED	QTY	COST (million $)
FY83	412	$4.0
FY84	412	$4.0
FY85	343	$3.4
FY86	292	$2.9
FY87	292	$2.9
FY88	292	$2.9
FY89	292	$2.9

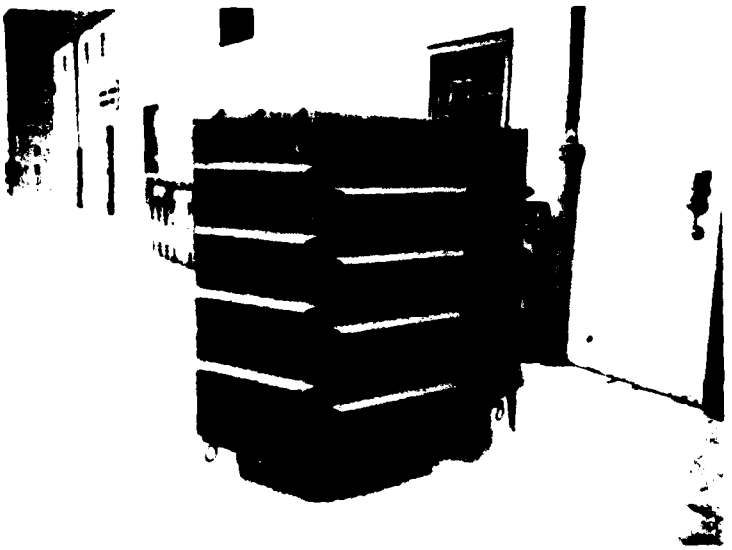
TOTAL (FY82-FY89) - - - $30,083,107

NOTE: All FMS costs were separately identified and funded by RSAF. PRAM efforts were totally directed toward USAF needs. The return on investment calculation was based on USAF savings/costs only.

Appendix

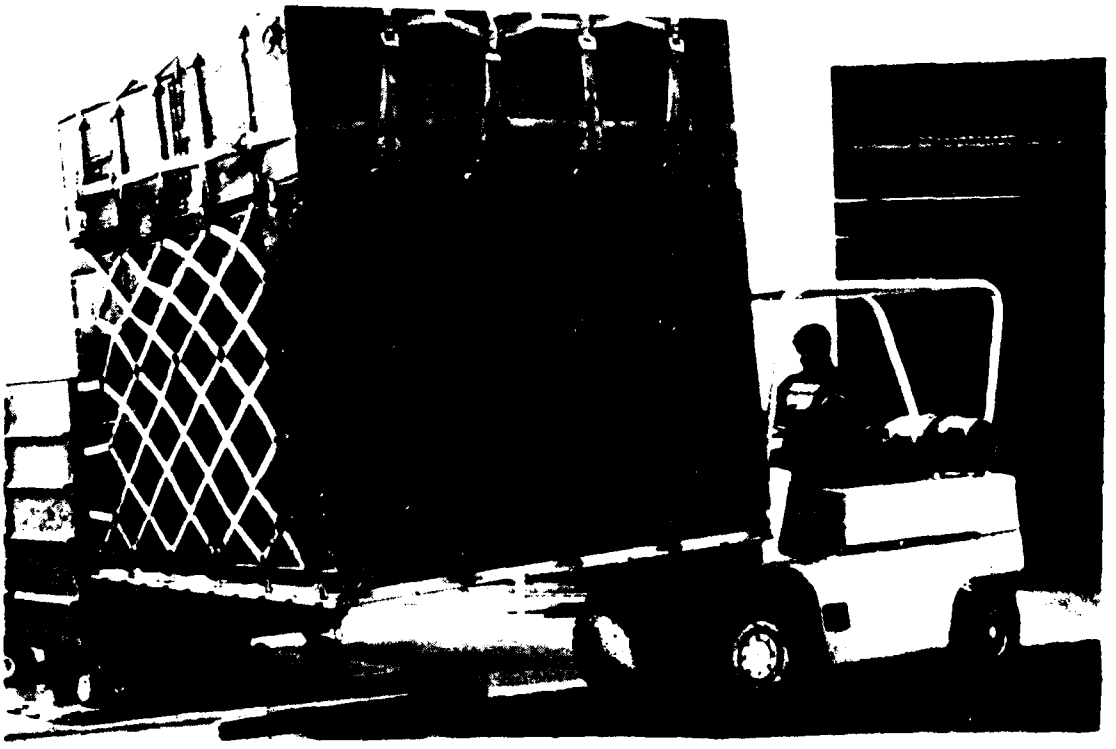
Following are references relating to the development of newly configured mobility containers.

Document	Title
MAC Ltr, 26 July 1982	Mobility Container Test, MAC Project 15-45-81
MAC Project 15-45-81	Final Report IOT&E Mobility Container System, July 1982
AFALD/PTP Program Management Plan	Redesign of Cargo Mobility Bins, June 1980
Contract F33700-81-C-0043, 3 Dec 1981	Development and Initial Production of Container Sets and Tire Racks
Project Report DARCOM 13-82, Jan 1983	Test of Fiberglass Mobility Containers For Army Use
Program Management Responsibility Transfer Plan, Final, 1 May 1983, between AFALD/PTP and WR-ALC/MMT	Newly Designed Air Cargo Mobility Containers

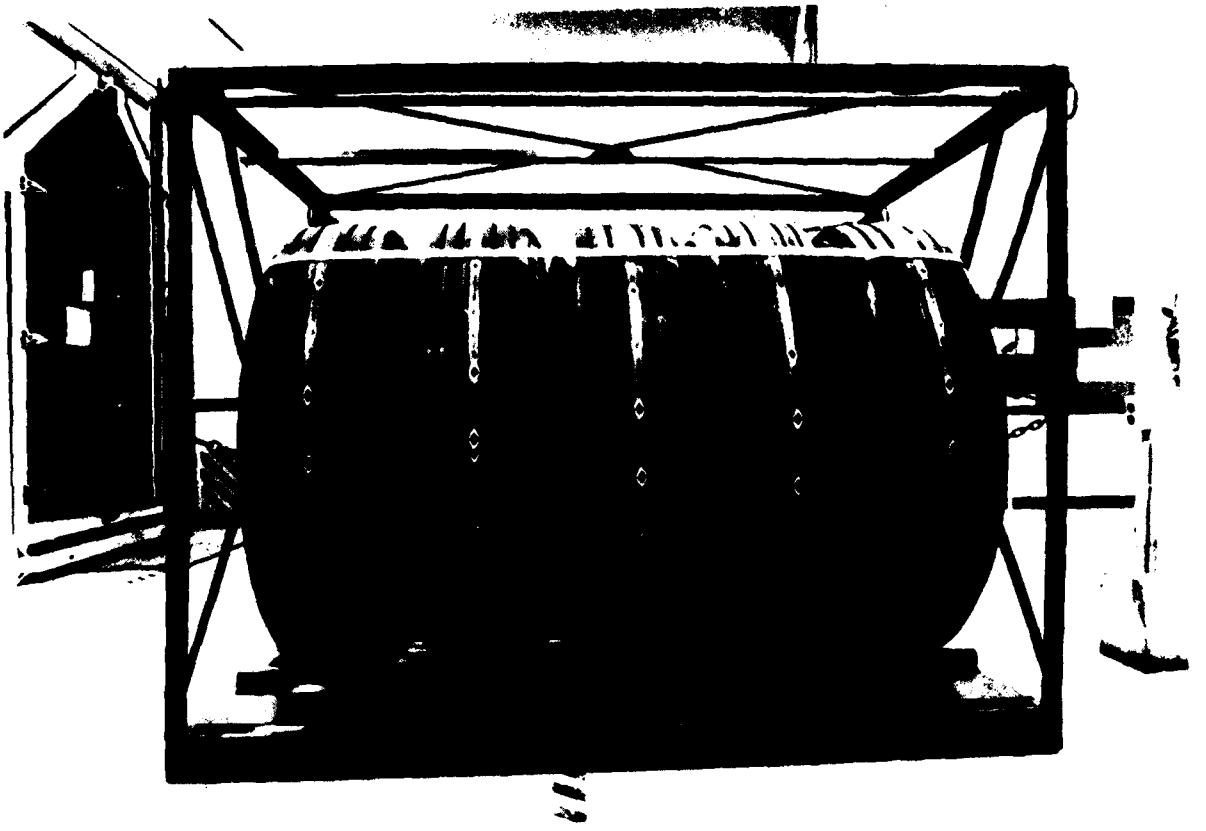


Old Mobility Containers

Atch 1

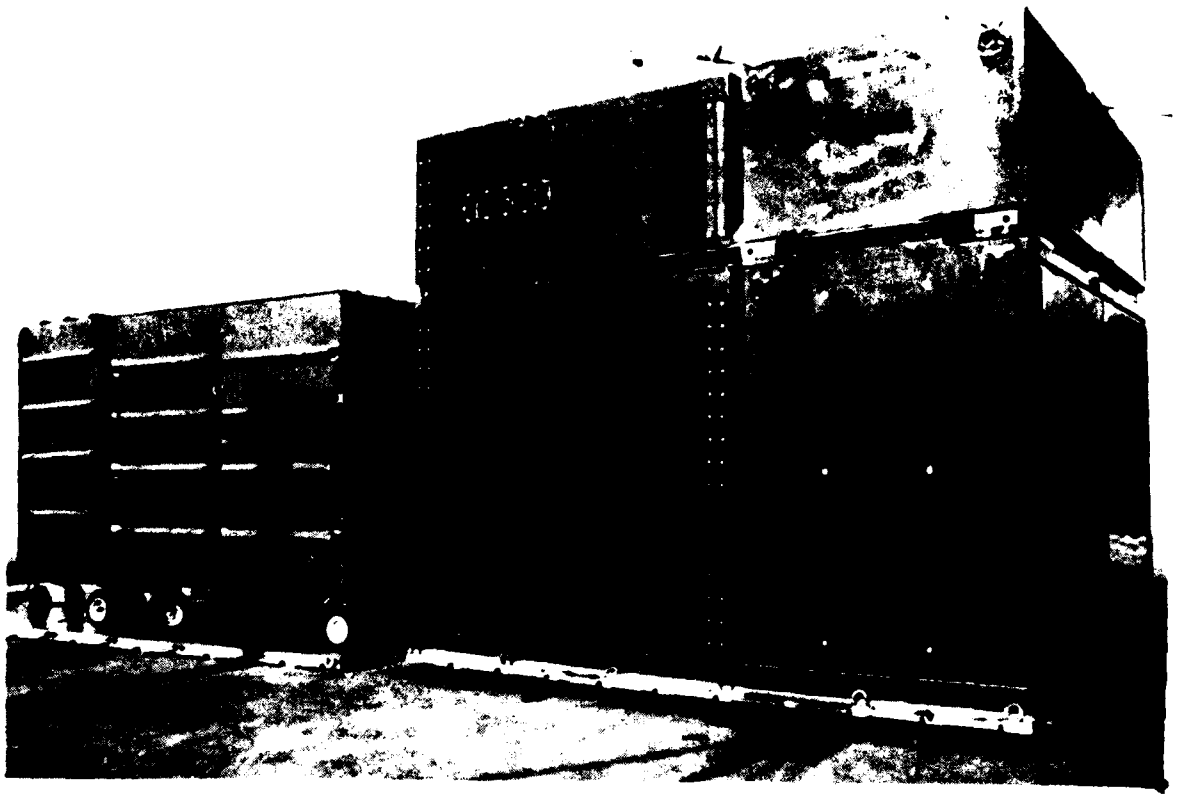


New Mobility Containers



New Tire Rack

Atch 3



Comparison of Old and New Mobility Containers

Mobility Containers
Data Sheet

January 1983

1. The newly designed air cargo mobility containers and tire racks for optimal cube usage of 463L pallet in C-141, C-130, and C-5 aircraft are being delivered to the Air Force. A set (6 ea) of modular containers cost $8,634 and consists of:

Unit/Set	NSN No.	Part No.	Dimension	Usable Cube (Cu. Ft.)	Tare Wt. (lb.)	Load (lb.)
1 ea	8145011189873	305341	84"x42"x60"	100	530	2170
1 ea	8145011189872	305342	84"x42"x30"	45	350	950
2 ea	8145011189884	305343	62"x42"x60"	73	450	1550
2 ea	8145011189874	305344	62"x42"x30"	31	300	700

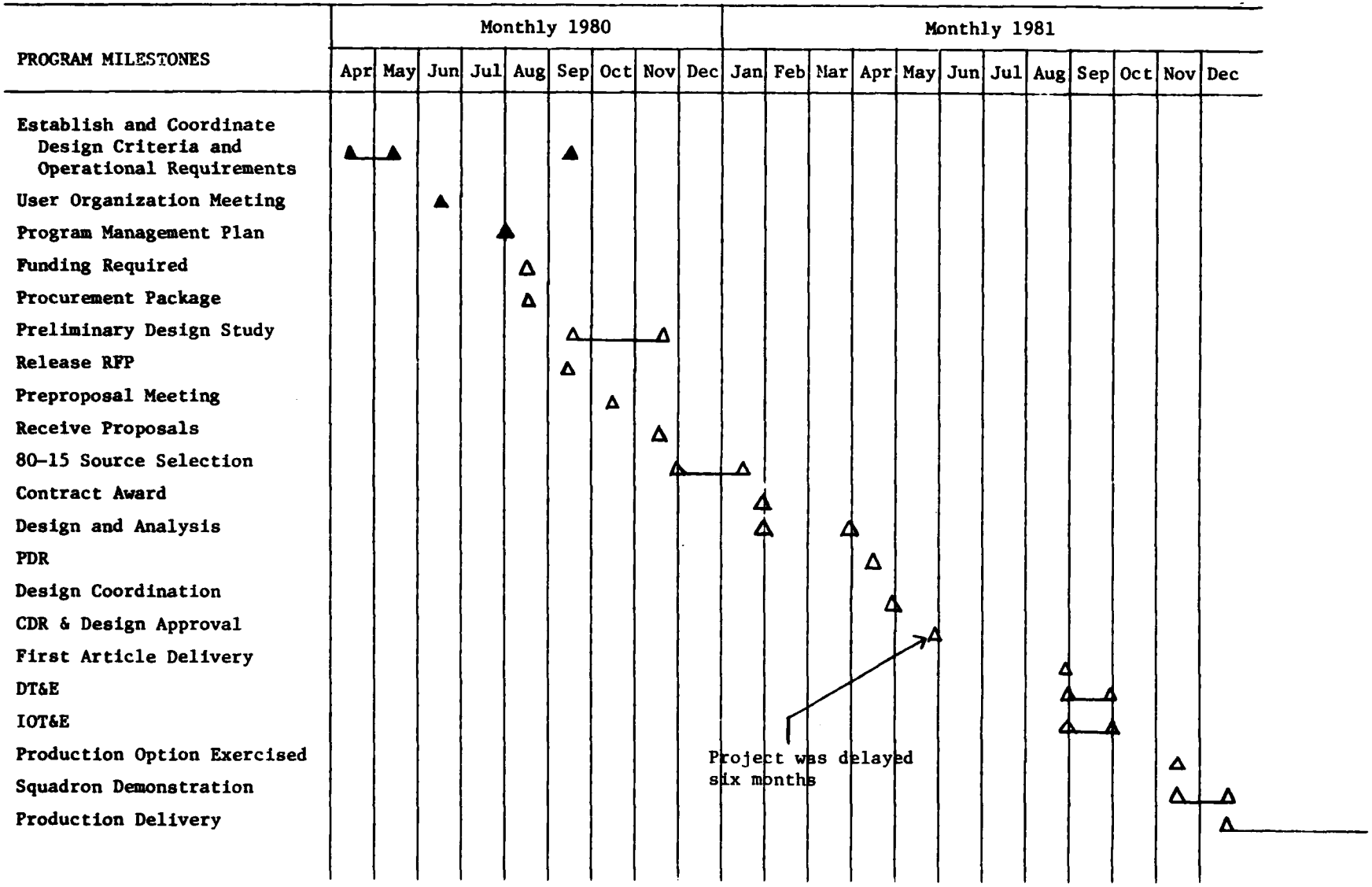
The tire racks cost approximately $1100 ea and have the following sizes:

NSN No.	Part No.	Dimension	Tire Size	Aircraft
8145011195342	305406-18	84"x22"x26"	17"-18"	F-4N, F-16N
8145011195344	305406-24	84"x28"x32"	21"-24"	F111N, A-7N, F-15N, A-10N
8145011246913	305406-28	84"x32"x36"	25"-28"	HH-53, F-16M, A-7M
8145011195343	305406-32	84"x36"x40"	29"-32"	F-4M, B-52W
8145011195340	305406-38	84"x42"x46"	35"-38"	F-15M, C-141M,A-10M, C-130N, EC-130N, KC-135N, EC-135N
8145011199549	305406-44	84"x48"x52"	44"	C-141M
8145011195341	305406-49	84"x53"x57"	46"-49"	E-3M, C-5M, KC-135M, E-111M, EC-135M
8145011195339	305406-57	84"x61"x65"	56"-57"	B-52M, C-130M, EC-130M

NOTE: The symbols after aircraft designation are; N-Nose Wheel, M-Main Wheel, W-Wing Wheel.

2. For additional information, please contact the Item Manager (IM), Marion Ray at WR-ALC/MMTDAC, Robins AFB GA, AV468-6078 or Commercial 912-926-6078. For Technical information, please contact Mr. Ralph Zynda, AFALD/PTPD, AV787-3120 or Commercial 513-257-3120.

PROGRAM MASTER SCHEDULE



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS MILITARY AIRLIFT COMMAND
SCOTT AIR FORCE BASE, ILLINOIS 62225

XPQT (MSgt Garbett, 3903) 26 JUL 1982

Mobility Container Test, MAC Project 15-45-81

HQ AFALD/PTPD

1. Subject test was conducted by the USAF Airlift Center (USAFALCENT) on 19-20 Apr 82. The final report is being formulated and will be published and distributed soon. We have learned that additional findings were obtained after the ALCENT personnel satisfied the objectives of the test and departed Dover AFB. Those findings were obtained by HQ USAF and HQ TAC personnel. We will not ask the Airlift Center to subscribe to findings that were not obtained by the test cadre. Those additional findings will not be in the final report.

2. HQ MAC/LGS has indicated that the data gained must be reported to the program office. That specific information is as follows:

a. Specific Method. The contents of different WRSKs were transferred from existing containers/break-bulk configuration to the Group A container system using three different options. Option one consisted of transferring the contents of a WRSK van, NSN 2330 00 288 6187, to the test container system with the objective of maximizing use of space. Option two consisted of transferring the contents of a 463L WRSK, composed of six mobility cargo bins, NSN 7125 00 872 1285, to the test container system. Option three consisted of transferring the contents of a C-141 WRSK TK, composed of van, mobility cargo bin, and break-bulk, to the test container system. Objectives of option three included improved space savings as well as improved accessibility and maintainability of WRSK items; i.e., each item was assigned an individual location which could be withdrawn with minimal removal of WRSK items.

b. Findings.

(1) Option one resulted in condensing WRSK storage requirements from 3 1/2 pallet spaces down to 2/3 of one pallet of Group A modules for a savings of 2 5/6 pallet spaces.

(2) Option two resulted in condensing WRSK storage requirements from two pallet spaces down to one pallet of Group A modules for a savings of one pallet space.

(3) Option three resulted in condensing WRSK storage requirements from 6 1/2 pallet spaces down to three pallets of Group A modules and two pallets of outsized boxes and tire racks for a savings of 1 1/2 pallets. Option three substantially improved accessibility and maintainability of WRSK relative to prior configurations.

(4) Adjustable shelves in the test modules substantially increased flexibility to accommodate WRSK items.

(5) Option three contained outsized items which would not fit into the test modules.

c. Conclusion. Space savings varied substantially depending upon prior WRSK configuration/containers used, bulk of items stored and user storage needs. Option one provided 81 percent space savings, option two 50 percent space savings, and option three 23 percent space savings. Options one and two were recognized as achieving the most space saving potential and would readily fit the need of tactical fighter forces, as would option three for the strategic airlift forces. Differing deployment concepts and item composition alter the space saving potential and dictate system configuration.

3. We hope these additional findings will assist you in making future program decisions.

DAVID D. WILSON, Colonel, USAF
Dep Dir of Operl Reqmts & Test
DCS/Plans

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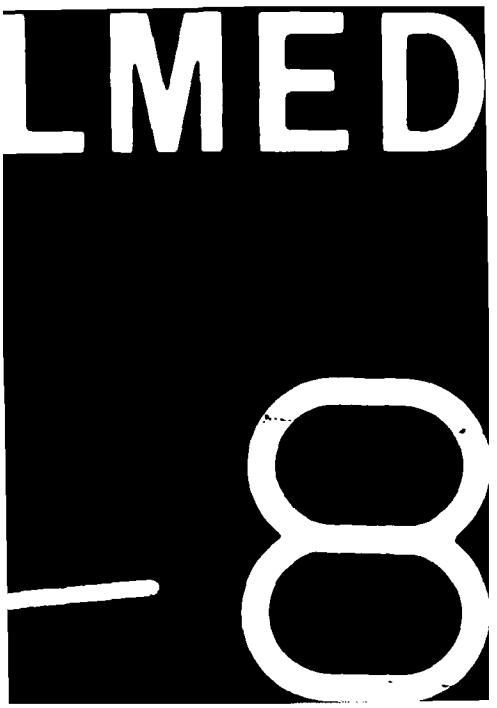
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